REMARKS/ARGUMENTS

In the non-final Office Action dated May 4, 2006, claims 1, 2, 5, 6 and 12 were rejected as anticipated by Sato et al. Claims 1, 2, 4-6 and 8-22 were rejected as being anticipated by Okuda et al.

The invention relates to methods and apparatus for cleaning substrates such as, but not limited to, semiconductor wafers and glass LCD substrates. See pages 1-8. A prior method involves forming an oxide film on the substrate with, for example, ozone water, and then etching the oxide film with, for example, HF, to thereby remove both the oxide film and along with it any particles or impurities on the substrate surface.

The invention aims at providing an etching process that is more efficient and better controlled than in the prior art. To this end, a physical cleaning step is added. Advantageously, the oxidation liquid supply and the physical cleaning may be controlled to occur at least partly at the same time. Page 4, line 14 - page 5, line 2.

The physical cleaning mechanism may comprise a dual spray nozzle which ejects the treatment liquid by the kinetic energy of gas. It may also comprise an ultrasonic nozzle for the treatment liquid or an ultrasonic vibrator for the substrate. Variations are described at pages 6-8.

Claim 1 has been amended by incorporating thereinto the previous recitation of claim 2. Claim 2 has been canceled.

Claim 8 has been amended by incorporating thereinto the previous recitation of claim 9. Claim 9 has been canceled.

Claim 12 has been canceled.

Claim 13 has been amended by incorporating thereinto the previous recitation of claim 14. Claim 14 has been canceled.

Thus, each of independent claims 1, 8 and 13 now recites an apparatus or step for supplying the oxidation liquid and carrying out the physical cleaning at least partially at the same time.

New claims 23 and 24 have been added. These claims are related to original claims 8 and 13 as well as the original disclosure on page 22, lines 14-25.

In the Office Action, the Examiner has newly cited U.S. patent application publication no. US2002/0035762 (Okuda et al.). Okuda et al. disclose, in Fig. 11 of their publication, a remover

liquid spray nozzle 1012, a deionized water spray nozzle 1025, a solvent spray nozzle 1039. These spray nozzles 1012, 1025 and 1039 supply the mists of remover liquid, deionized water and organic solvent, respectively. The definition of the remover liquid is found in paragraph number 0152, according to which the examples of the polymer remover liquid include an inorganic acid such as hydrofluoric acid and phosphoric acid. The organic solvent is used as an intermediate rinse liquid. According to the paragraph number 0156, the examples of the intermediate rinse liquid include functional water such as ozone water and hydrogen water. In view of these descriptions, Okuda et al. teach supplying deionized water supply with a dual fluid spray nozzle and supplying an oxidation liquid supply with a dual fluid spray nozzle.

Okuda et al. further disclose, in Fig. 19 in their publication, a remover liquid nozzle 3007 with a vibrator 3025, and a deionized water nozzle 3009 with a vibrator 3039. Okuda et al. therefore teach imparting ultrasonic vibration to a treatment liquid to be supplied to a substrate.

In paragraph number 0295 of Okuda et al.'s publication, there is a recitation of hydrogen peroxide water liquid as an example of chemical liquids to be supplied to a spray nozzle. In paragraph number 0325, there is a description that ozone gas may be supplied to a spray nozzle. In paragraph number 0523, there is a description that ozone water may be used as a rinse liquid instead of deionized water.

Thus, Okuda et al. merely disclose imparting ultrasonic vibration to a treatment liquid before the treatment liquid is supplied to a substrate. Okuda et al. however fail to disclose simultaneously supplying the jet flow of droplets of treatment liquid from a dual fluid spray nozzle and oxidation liquid from an oxidation liquid nozzle to a substrate surface. For example, in Fig. 12 of Okuda et al.'s publication, the deionized water supplying step is performed after completion of the supply of the organic solvent as an intermediate rinse liquid. That is, Okuda et al. do not teach or suggest simultaneously supplying intermediate rinse liquid from the solvent nozzle and deionized water from the deionized water spray nozzle. Therefore, the independent claims 1, 8, and 13 of the present application after the above-mentioned amendments are patentably distinguishable from the teachings of Okuda et al.

Regarding Sato et al., the discussion of this reference on pages 8-10 of the Amendment of February 6, 2006, is incorporated by reference. Claims 1, 8 and 13 are distinguishable from Sato et al. for the reasons already discussed.

New claims 23 and 24 state that an ultrasonic vibration is imparted to a treatment liquid having been supplied onto the substrate surface by bringing an ultrasonic vibrator into contact with a film of the treatment liquid that has been supplied to the substrate surface. Such a feature is not taught or suggested by either Sato et al. or Okuda et al.

In view of the foregoing, allowance of claims 1, 4-6, 8, 10-11, 13 and 15-24 is requested.

THIS CORRESPONDENCE IS BEING SUBMITTED ELECTRONICALLY THROUGH THE PATENT AND TRADEMARK OFFICE EFS FILING SYSTEM ON August 4, 2006.

JAF:lf

Respectfully submitted,

James A. Finder
Registration No.: 30,173
OSTROLENK, FABER, GERB & SOFFEN, LLP
1180 Avenue of the Americas
New York, New York 10036-8403
Telephone: (212) 382-0700